CHAPTER THREE:
WATERSHED ANALYSIS

Introduction

This chapter summarizes the existing and pre-settlement condition of the watershed. It addresses the elements and processes influencing the Beaver Creek watershed.

The Physical Environment

Streams and Hydrology

The Beaver Creek watershed has an unusually high proportion of low-gradient streams flowing through broad, unconfined valleys. The western, or lower portion of the watershed contains extensive wetlands and potential wetlands. Map 3 is a pre-settlement vegetation map prepared by the Oregon Natural Heritage Program in 2001. The map was developed using Government Land Office (GLO) Survey notes taken from the 1867 to 1882. Areas mapped as W, WMU and WSM depict wetland vegetation noted by the GLO surveyors. More information about the map and how it was created is in the analysis files.

The wetlands are underlain by the Nestucca Formation, the Alsea Formation, the Yaquina Formation, and Quaternary terrace deposits (see Map 4: Lithology and Landslides). These formations and deposits are made up of erosive sedimentary rocks. The topography in the western part of the watershed is gentle, with wide, flat valleys allow for wetland development.

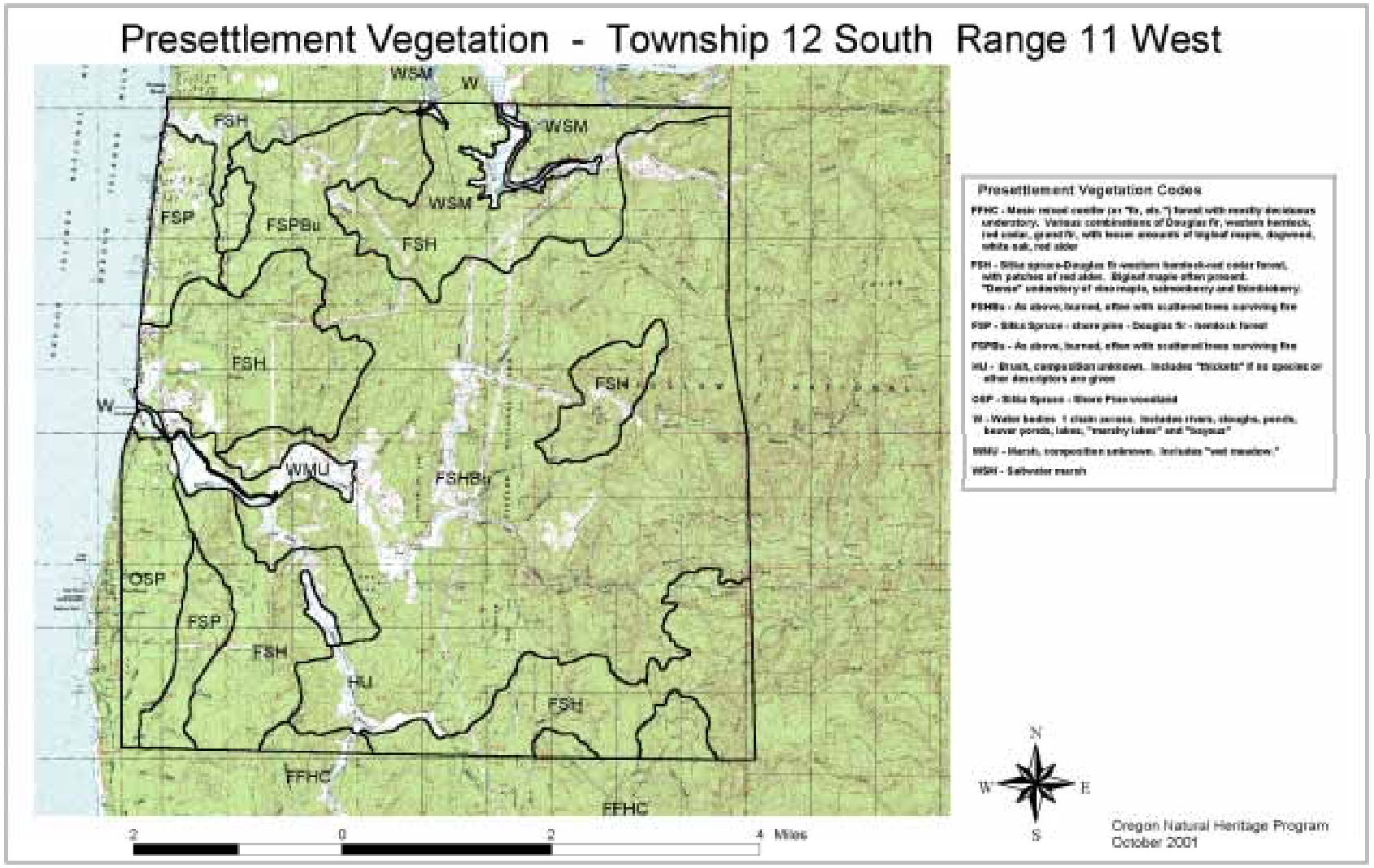
The eastern part of the watershed is underlain by the Tyee Formation: siltstones and sandstones that are more resistent to erosion than the rocks to the west. Thus, ridges are higher, slopes steeper, streams are more confined, and valleys are more incised.

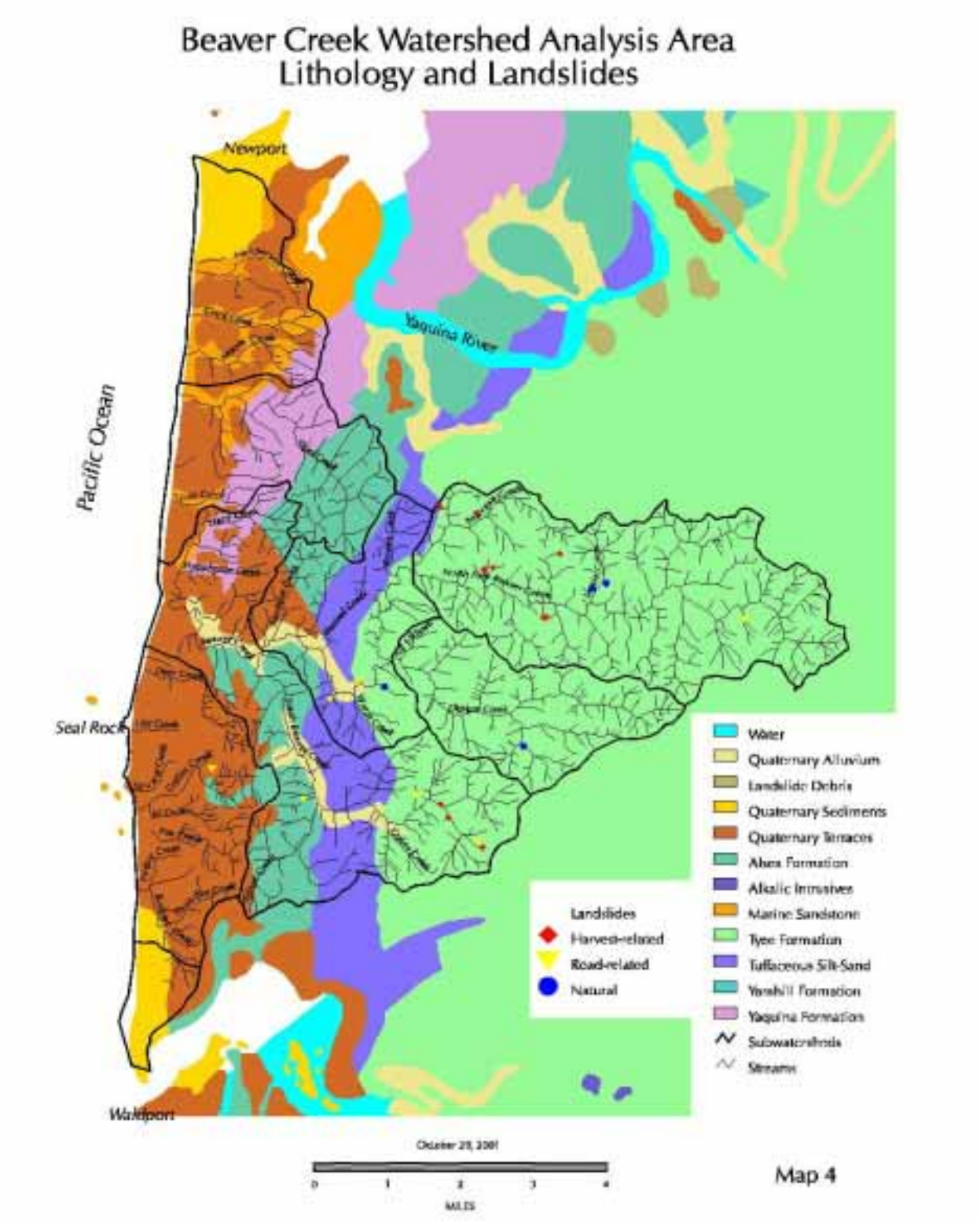
Streams in the Beaver Creek watershed were stratified into functional segments based on how steep and confined they are (see Map 5: Geomorphic Stream Segments – following Montgomery and Buffington's 1993 methodology). Level of confinement is based on a depth to width ratio.

Source reaches are those with a gradient steeper than eight percent that are at least moderately confined. These reaches may flow intermittently, but respond quickly to storm events and are subject to periodic scour by debris torrents. These segments are important sources of cool water and pulses of sediment and wood to the rest of the stream system.

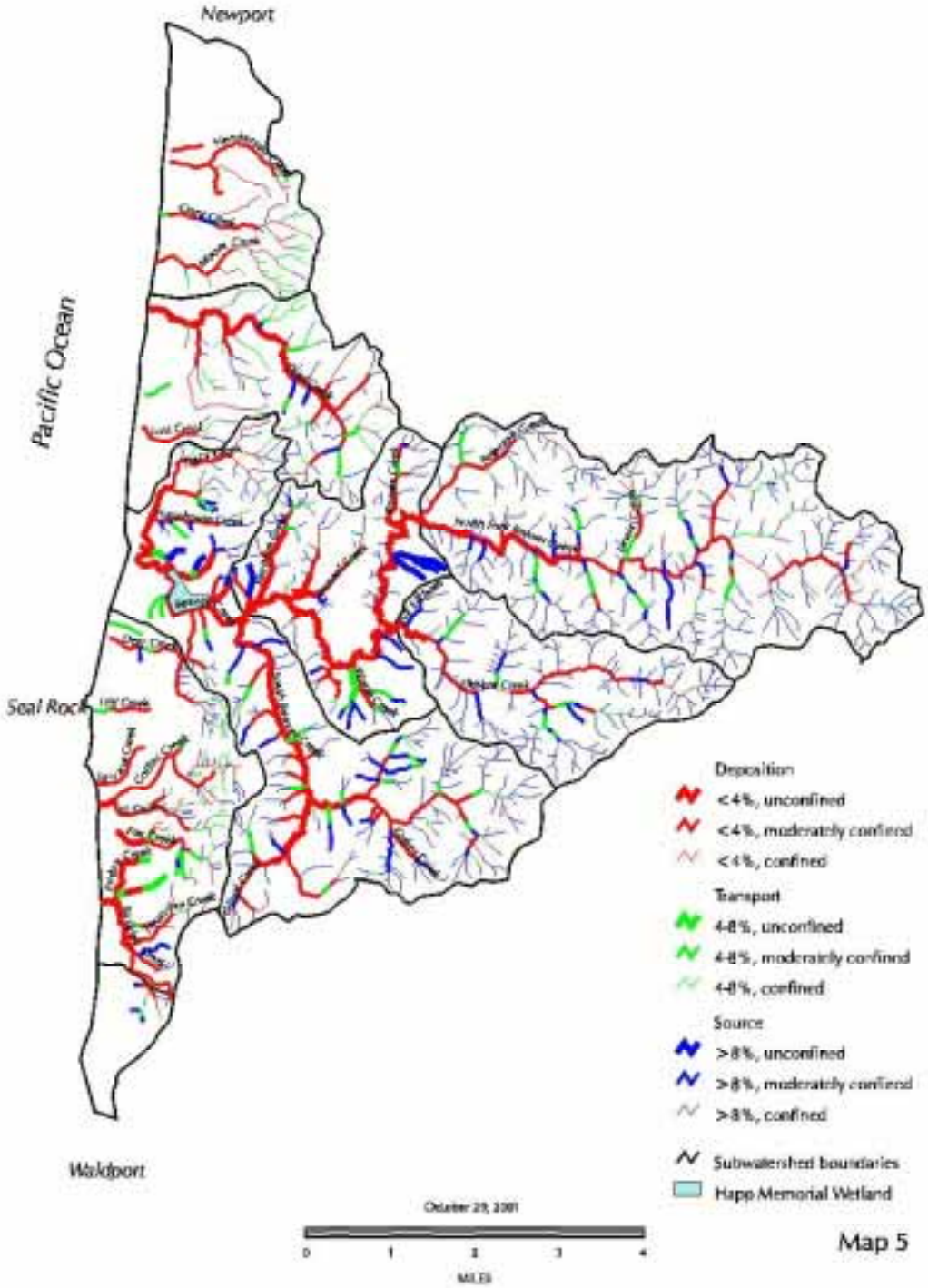
Transport reaches range between four and eight percent grade and are confined. They generally flow year round. Storage of sediment and wood in these reaches is temporary – high intensity storms will move material to stream segments lower in the system. These reaches are relatively resistant to long term geomorphic change caused by wood and sediment inputs because of the transitory nature of this material.

Map 3


Presettlement Vegetation - Township 12 South Range 11 West
WSM
W
FSH
WSM
FSP
FSPBu
WSM
FSH
FSH
FSH
W
WMU
FSHBu
OSP
FSP
FSH
HU
FSH
FFHC
FFHC
2
0
2
4 Miles
Presettlement Vegetation Codes
FFHC - Mesic mixed conifer (ex "fir, etc.") forest with mostly deciduous understory. Various combinations of Douglas fir, western hemlock, red cedar, grand fir, with lesser amounts of bigleaf maple, dogwood, white oak, red alder
FSH - Sitka spruce-Douglas fir-western hemlock-red cedar forest, with patches of red alder. Bigleaf maple often present. "Dense" understory of vine maple, salmonberry and blackberry
FSHBu - As above, burned, often with scattered trees surviving fire
FSP - Sitka Spruce - shore pine - Douglas fir - hemlock forest
FSPBu - As above, burned, often with scattered trees surviving fire
HU - Brush, composition unknown. Includes "thickets" if no species or other descriptors are given
OSP - Sitka Spruce - Shore Pine woodland
W - Water bodies 1 chain across. Includes rivers, sloughs, ponds, beaver ponds, lakes, "marshy lakes" and "bogous"
WMU - Marsh, composition unknown. Includes "wet meadow."
WSM - Saltwater marsh
N
W
E
S
Oregon Natural Heritage Program
October 2001


Beaver Creek Watershed Analysis Area
Lithology and Landslides
Newport
Yaquina River
Pacific Ocean
Seal Rock
Waldport
Water
Quaternary Alluvium
Landslide Debris
Quaternary Sediments
Quaternary Terraces
Alsea Formation
Alkalic Intrusives
Marine Sandstone
Tyee Formation
Tuffaceous Silt-Sand
Yaquina Formation
Landslides
Harvest-related
Road-related
Natural
October 29, 2001
0
1
2
3
4
MILES
Map 4

Beaver Creek Watershed Analysis Area
Geomorphic Stream Segments



Map 5

Depositional reaches have gradients less than four percent and are moderately confined or unconfined (unconfined depositional). Depositional reaches flow year round are strongly influenced by material that comes from the source and transport reaches. Healthy depositional reaches that are moderately confined provide long-term storage areas for substrates and wood. Unconfined depositional reaches meander across their wide valley bottoms and are associated with the extensive wetland system. Tidal flow contributes to wetland maintenance.

As the Beaver Creek watershed was developed for agriculture, some of these wetland areas were drained, ditched and diked. Modifications occurred along both forks of Beaver Creek, but not the main stream. During summer, the ditches efficiently carry Beaver Creek streamflow. During the wet months, flows routinely spill out onto the floodplains. The typically clear discharge of Beaver Creek into the ocean, even during floods, indicates that the watershed is still functioning well and efficient at holding and slowly releasing sediment and nutrients (Bob Buckman, personal communication, 1999).

Storms and Floods

In the Coast Range, stream flow reflects precipitation events with an annual cycle of high, flashy flows during the winter and low base flows during the summer months when most of the flow from channels is derived from emerging groundwater. Probability of flooding where waters exceed the channel is once every two years, with large floods occurring less frequently. Notable flood years in the Coast Range include 1861, 1890, 1909, 1927, 1953, 1955, 1964, 1974, 1982, 1983 and 1996. Floods in 1941, 1948 and 1949 were blamed on high tides and sand deposits that blocked the mouth of the creek.

Several newspaper articles from local newspapers during the 1940's and 1950's that were compiled by Ranger D. Bayer describe frequent flooding in the lower Beaver Creek and at the mouth[1]. This 1948 article from the Waldport Record describes the conditions at the mouth of the creek:

> *During the freak storm of two weeks ago, high waves did so much damage at Beaver Creek that the normal channel became clogged with debris and sand. The creek could not empty into the ocean as usual with the result that its waters backed up inland.*
>
> *The road was soon covered with water and the mill-pond of the C and H Lumber Company over flowed.*
>
> *The mill was forced to shut down and the cars of people living up the Creek had to be towed in and out be the company trucks. Finally road conditions got so bad that not even these could get through.*
>
> *Dynamiting to open the channel was the only solution and this the company proceeded to do. A few hours later, the creek had found its bed nearly 3 feet below the level of the sand deposited by the high water.*
>
> *Everyone in the vicinity is grateful to the lumber company and the State and County workers who spared neither time nor energy in this emergency.*

[1] Flooding at Beaver Creek was noted in articles dated February 25, 1926; March 4, 1926; December 25, 1941; November 18, 1948; November 17, 1949; and November 6, 1952.

A December 8, 1949 article from the Lincoln County Times reported on a hearing for Beaver Creek flood control. It describes the cause of frequent flooding this way:

> *Conditions at the mouth of Beaver creek have been such that ocean swells and tides have prevented the natural flow of the stream. This has resulted in the annual flooding of many acres of good farm land; as well as the formation of a permanent swamp. Beneath this swamp lies about a thousand acres of peat soil which can be surpassed no where as far as fertility and productiveness is concerned.*

In 1999, the Corps of Engineers had no record of flood control projects being implemented at Beaver Creek.

A large storm in February, 1996 resulted in debris torrents in the headwaters of the North Fork of Beaver Creek, the headwaters of Elkhorn Creek, Lewis Creek and Peterson Creek. Most of the landslides from this event occurred on the Tyee Formation, with the exception of one road-related slide that occurred on the Alsea Formation (see Map 4: Lithology and Landslides).

Water Temperature

Water temperature has been monitored in the North Fork of Beaver Creek, Elkhorn Creek, and Peterson Creek from 1994 to 1996. State water temperature standards stipulate that a 7-day moving average of the daily maximum temperature shall not exceed 64 degrees Fahrenheit. Exceptions are made for periods of unusually warm weather, or if naturally occurring conditions prevent the stream from remaining below 64 degrees F.

Water temperatures were measured at 6 locations along the mainstem of the North Fork. Above Peterson Creek, two sites met state water quality standards. Site #28, which is 2 miles upstream of Peterson Creek, reached a 7-day average maximum temperature of 68 degrees F in 1994, although it was only 63 degrees F in 1995.

Peterson Creek had one year of data that was collected at the mouth. The 7-day average maximum temperature reached 62 degrees F, which complies with state standards.

Elkhorn Creek was monitored one mile upstream of the mouth for one year, 1994. The 7-day average maximum temperature reached 60 degrees F, which complies with state standards.

Two sites were monitored in the North Fork of Beaver Creek downstream of Elkhorn Creek. Both sites were above state water quality standards for all years they were monitored. The lowest site in Beaver creek, which is just upstream from Simpson Creek, was usually cooler than the site farther upstream and just below Elkhorn Creek.

The North Fork Beaver Creek above Peterson Creek, and Elkhorn Creek are east-west trending streams with a fairly high level of shading. The mainstem of Beaver Creek below Elkhorn Creek, in contrast, runs through pasture land in a wide valley that has minimal to non-existent shading. The slightly lower temperatures at the lowest site on Beaver Creek may be due to higher groundwater inputs, and/or the proximity to the ocean and the fog zone cooling.

Table 4 summarizes the temperature data.

Table 4: Stream temperature data from the Beaver Creek Watershed

Site Name	GIS Station Number	1994 Max. 7-day ave. high	1994 #days above DEQ standard	1994 Max. Instantaneous High	1995 Max. 7-day ave. high	1995 #days above DEQ standard	1995 Max. Instantaneous High	1996 Max. 7-day ave. high	1996 #days above DEQ standard	1996 Max. Instantaneous High
NF Beaver Cr, 1 mile upstream Lewis Cr	20	62F	0	63F	61F	0	61F	no data	no data	no data
Elkhorn Cr, 1 mi upstream of mouth	22	60F	0	62F	no data	no data	no data	no data	no data	no data
Peterson Cr at mouth	23	62F	0	68F	no data	no data	no data	no data	no data	no data
NF Beaver Cr 2 mi upstream	28	68F	8	70F	63F	0	65F	no data	no data	no data
Beaver Cr, upstream Peterson Cr	145	no data	no data	no data	64F	0	65F	no data	no data	no data
Beaver Cr, upstream Simpson Cr	187	66F	42	67F	65F	19	67F	no data	no data	no data
Beaver Cr upstream Elkhorn Cr	196	68F	42	70F	66F	27	68F	68F	55	70F

The Biological Environment: Aquatic

Source, transport and depositional streams all provide habitat for aquatic species. Within source reaches, aquatic habitat is limited due to the steep, episodic nature of disturbance events in these stream segments. Cutthroat trout and steelhead use lower portions for spawning, and cutthroat trout may remain as residents in some of these reaches. Cutthroat and steelhead use transport reaches, and as long as logjams exist to trap gravel and provide cover, coho will spawn and rear there as well. Gravels accumulated in moderately confined, depositional areas provide excellent spawning and rearing habitat for coho and steelhead. Low-gradient, unconfined reaches, oxbows and braided channels serve as excellent coho and steelhead rearing and cover. The lower reaches of Beaver Creek remain closely connected with their floodplains, providing refugia where young fish can feed and escape the strong currents of the floodwaters.

Habitat for aquatic organisms (notably anadromous salmonids) seems to have held up better over the years in Beaver Creek than in other nearby streams. Young coho salmon and cutthroat trout produced during the summer in numerous gravel beds and rearing pools found on National Forest lands in the headwaters move downstream for additional rearing in vast low-gradient stream reaches, wetlands, and estuarine areas on private land. The habitat areas complement each other, functioning like the lake systems on the Oregon Coast (Devils, Siltcoos, Tahkenitch) that are also strongholds for coho salmon in the state. The high coho production is likely related to the refugia provided by the lake and/or wetland system.

Instream Habitat Components

Stream survey data (USFS 1984 and 1988; ODFW 1998) indicate that Beaver Creek is a dynamic system, with sediment, nutrients, food, and wood moving down the channel during high flow events and becoming deposited downstream, where they contribute to critical fish habitat. Settlement activities such as logging, stream cleanout, agriculture, and building valley bottom roads along depositionalal reaches have affected the functioning and quality of the fish habitat.

Diking, channelization, and large wood removal has encouraged some downcutting of the channel so that depositionalal reaches may function like transport reaches, moving wood and substrate out of the system and into the open estuary. Rapid run-off leads to peak flows that are frequent, longer lasting and higher.

All reaches in the basin except for the extreme headwaters of Elkhorn Creek are short of both large woody material (LWM) and resultant deep pools (Figures 1 and 2).

Removing roughness elements (logs and boulders) from the channel increases velocity of the water and causes additional scour. Additional impacts include reduced subsurface flow and increased water temperatures, and occasional widening of streams due to lateral scour of streambanks when the channel reaches bedrock. Occasionally, there are entrenched channels, and fewer side channels and backwater alcoves (very important for coho salmon rearing).

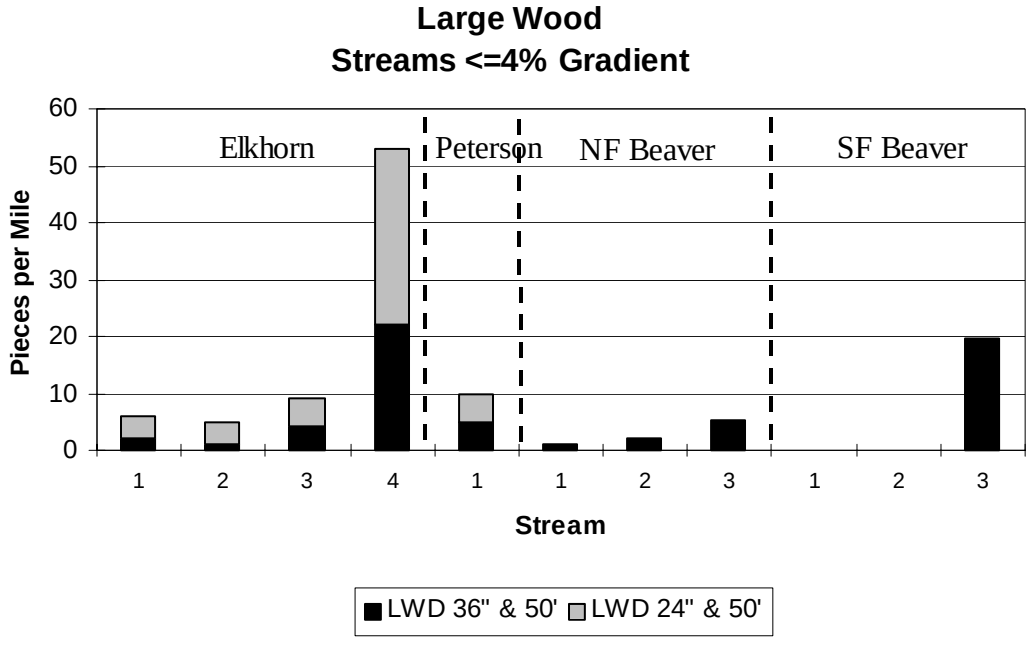


Figure 1: Large Wood Values for Selected Reaches

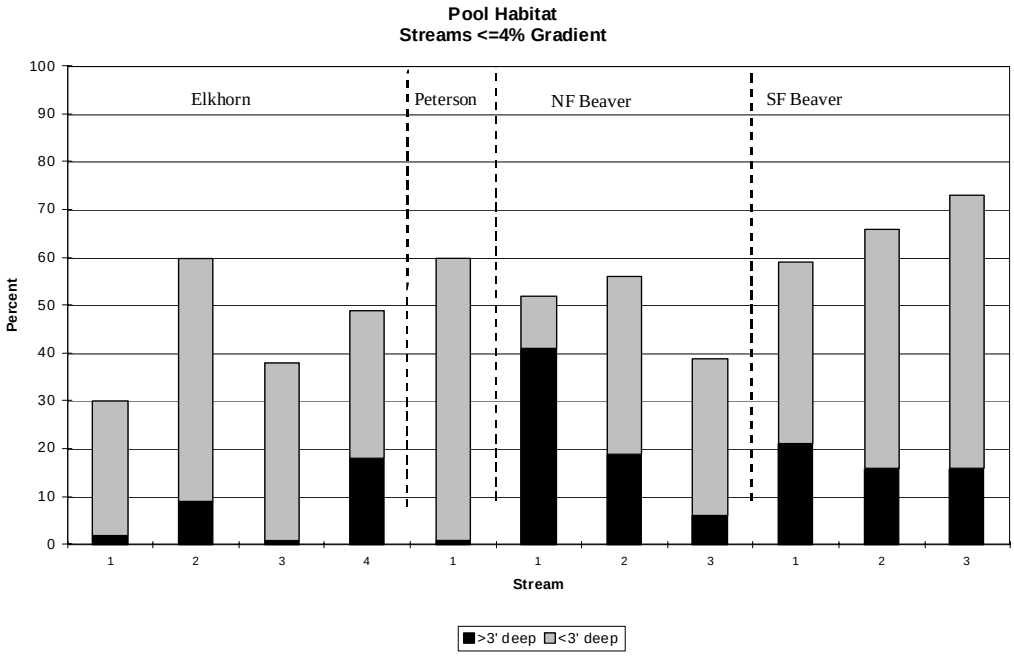


Figure 2: Pool Habitat Values for Selected Reaches

Stream Functional Ratings

Quantitative measures of components of fish habitat within four Beaver Creek subwatersheds were taken from existing Level-II stream survey data gathered by the Forest Service (Elkhorn, Peterson, and Lewis creeks and smaller tributaries), and similar information from ODFW (mainstems of North and South Beaver). These measures of various habitat components were rated according to the Matrix of Factors and Indicators for the Oregon Coast Province developed for consulting with the National Marine Fisheries Service (NMFS) on effects of activities on the threatened coho salmon. Key stream reaches are rated as functioning, not functioning, or at risk based on whether certain water quality, habitat and disturbance factors are within certain ranges[2].

Table 5 shows the ratings for each factor on the matrix, along with an overall rating. Map 6: Fish Habitat Ratings displays the overall ratings for each low-gradient stream reach that had completed surveys. Reaches within the privately owned main Beaver Creek downstream from the mouth of the North Fork were not rated.

Habitat conditions over the entire area are good, but below their potential. Only one of the surveyed reaches met properly functioning criteria for LWM; others mainly met criteria for temperature, various aspects of pools, and access. No quantitative measures of estuarine habitats were available, but Highway 101 and Ona Beach State Park may have modified the mouth of Beaver Creek to the degree that it is not functioning properly.

[2] Value ranges for functional classifications associated with the Matrix of Factors and Indicators are in the analysis files.

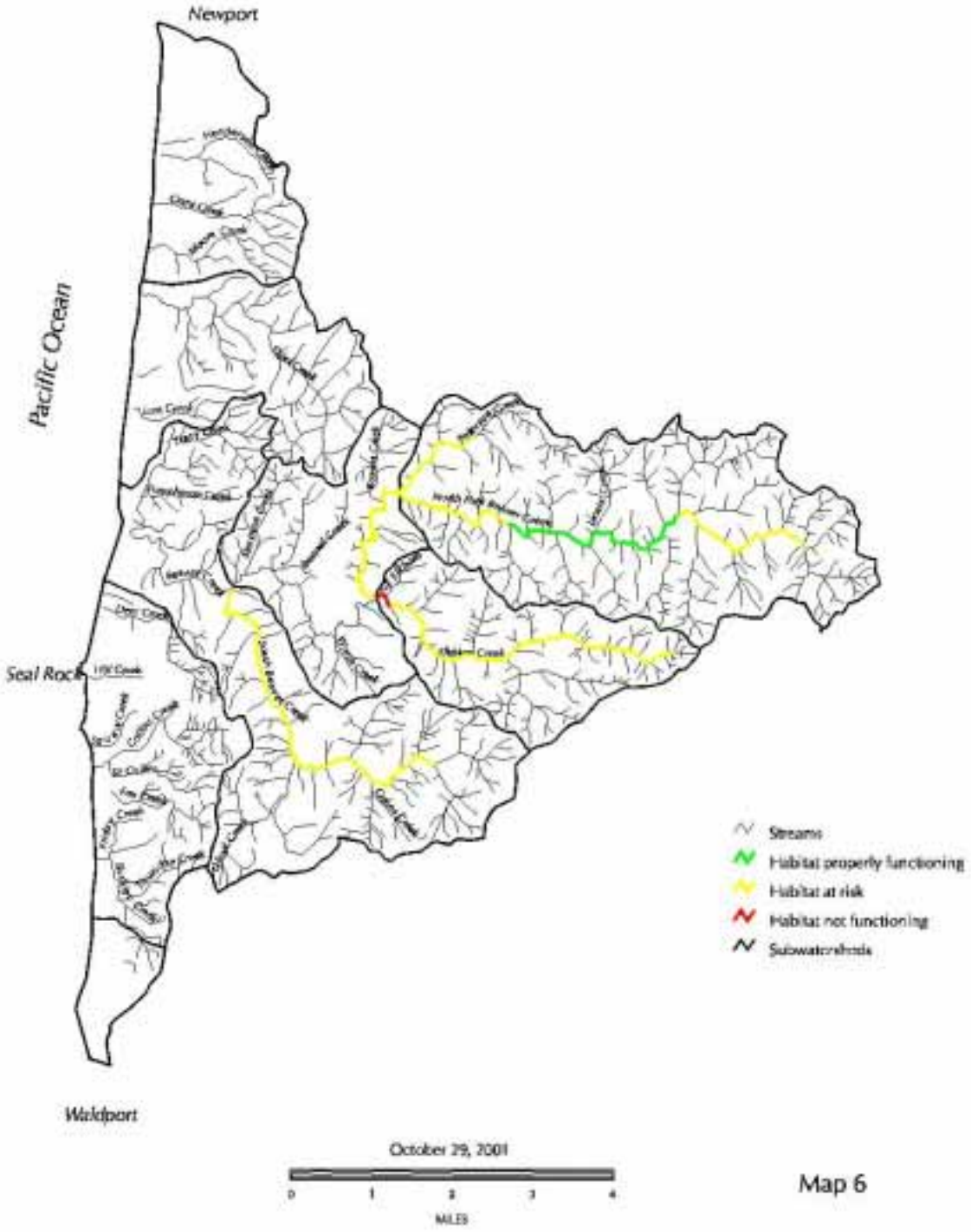
Table 5: Matrix of Factors and Indicators for Key Stream Reaches

	Stream Name and Survey Reach										
	Peterson Creek	North Fork Beaver Creek			South Fork Beaver Creek			Elkhorn Creek			
	1	1	2	3	1	2	3	1	2	3	4
Water Quality Factors											
Temperature	**R**	**R**							**R**		
Turbidity											
Chemistry											
Habitat Access											
Physical Barriers	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**	**P**
Habitat Elements											
Substrate	**R**	**N**	**P**	**P**	**R**	**N**	**R**	**N**	**R**	**R**	**R**
LWM	**N**							**N**	**N**	**N**	**R**
Pool Area %	**P**	**P**	**P**	**R**	**P**	**P**	**P**	**N**	**P**	**R**	**R**
Pool Quality	**N**	**P**	**P**	**R**	**R**	**P**	**R**	**N**	**P**	**R**	**R**
Pool Frequency	**P**	**R**	**N**	**R**	**N**	**R**	**R**	**R**	**P**	**P**	**R**
Off-channel	**N**							**N**	**N**	**N**	**P**
Channel Condition											
Streambank											
Floodplain											
Watershed Condition											
Road Density	**R**	**N**	**R**	**R**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
Disturbance History											
Riparian Areas											
Refugia											
OVERALL	***R***	***R***	***P***	***R***	***R***	***R***	***R***	***N***	***R***	***R***	***R***

P = Properly Functioning R = At Risk N = Not Properly Functioning

Blank cells indicate data gaps.

Beaver Creek Watershed Analysis Area
Fish Habitat Ratings



Map 6

The lower reach of Elkhorn Creek, rated as non-functioning, appears to be one of the poorer areas for salmonid rearing. Other reaches, particularly Reach 2 of North Beaver Creek, appear to be functioning reasonably well, although data are somewhat sketchy. Any such functional reaches should be considerable fish producers, with potential for fairly quick gains from restoration. Most portions of Beaver Creek, being slow and meandering, have a very high proportion of fines (sand and silt) in the substrate yet are good habitat for young coho salmon.

Riparian Vegetation and the Aquatic Environment

In the early 1900s, timber harvest and road construction began to remove riparian vegetation from steeper streams. The result of these activities has been to locally reduce the amount of large conifers available to provide shade, nutrients and a source of future LWM. For the most part, natural succession has been allowed to proceed resulting in small and medium conifers and alders established in most riparian areas. However, it may be several more decades before the riparian vegetation is large and begins to be recruited into the streams. Conifers are expected to be a more dominant component of riparian stands within the next few decades.

Riparian areas in Beaver subwatershed (including the lower portion of the North Fork and mainstem Beaver Creek downstream to the mouth of the South Fork) contain grass/forb pastureland and hardwood-dominated tree stands. Vegetation along transition reaches is a mix of deciduous trees and conifers in the understory and clumps of conifers coming near the stream along toeslopes.

Moving upstream, conifer stands increase and are most prevalent (15-20 percent) in the federal portions of Elkhorn and North Fork. Narrow, relatively pure bands of conifers are common in the upper (source reaches) of streams where slope failures have not occurred, while alder dominates the recent failure sites of several headwater streams.

Figures 3 and 4 display vegetation composition within 200 feet of streams. Figure 3 displays vegetation along steeper gradient creeks (greater than 8 percent); Figure 4 shows vegetation along streams less steep than 8 percent.

Water Temperature and Fish

Water temperature is a determining factor in the species composition and productivity of the aquatic ecosystem. Water temperatures can control the fish and other aquatic organism distribution within a watershed. Warm water species such as dace can out-compete cold water species (salmonids) when temperatures rise. Tributaries that are able to maintain cooler temperatures are critical to maintain as refugia.

Increases in water temperature directly affect salmonid stress levels. When under stress, salmonid populations may have reduced fitness, greater susceptibility to disease, decreased growth, and changes in time of migration or reproduction. Higher water temperatures reduce water oxygen capacity, which leads to greater stress. Optimum temperatures for survival and growth are at or below 58 degrees F. Above 64 degrees F, the fish become stressed; survivability and growth decrease as the temperature rises. Sustained temperatures above 70 degrees F will result in mortality for anadromous salmonids. Availability of cold water refuges, such as cooler stratified layers in deep pools, or under-gravel seeps can partially compensate for such effects.

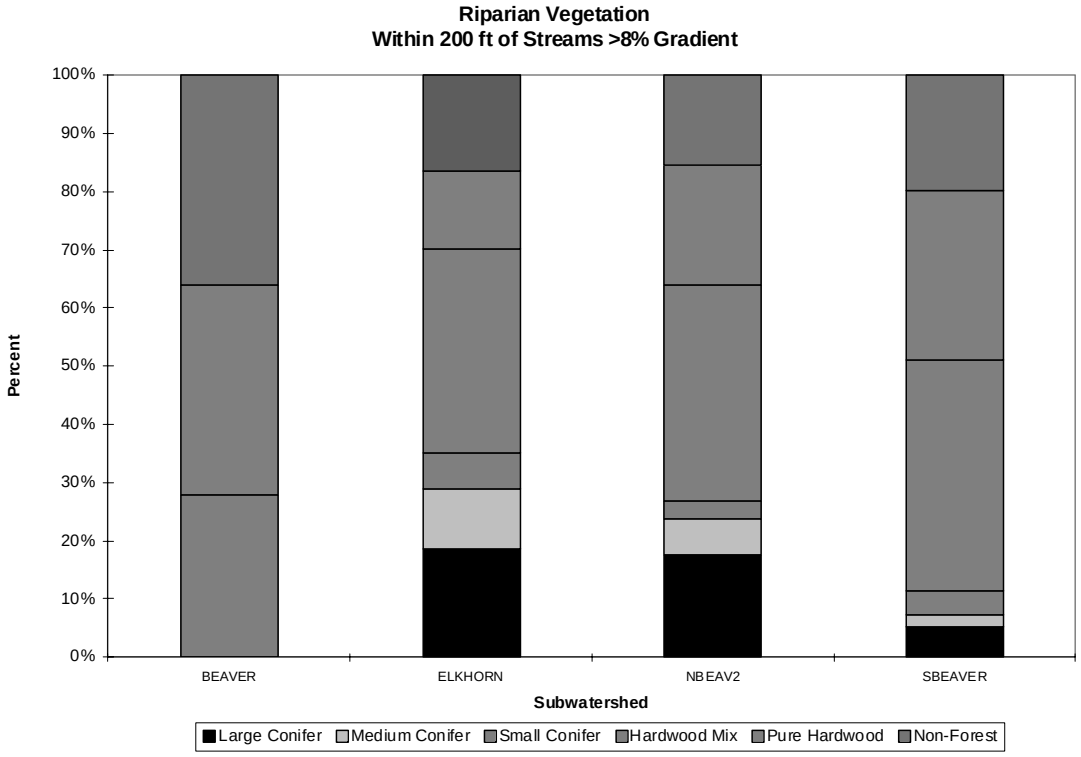


Figure 3: Riparian Vegetation Along Steeper Creeks

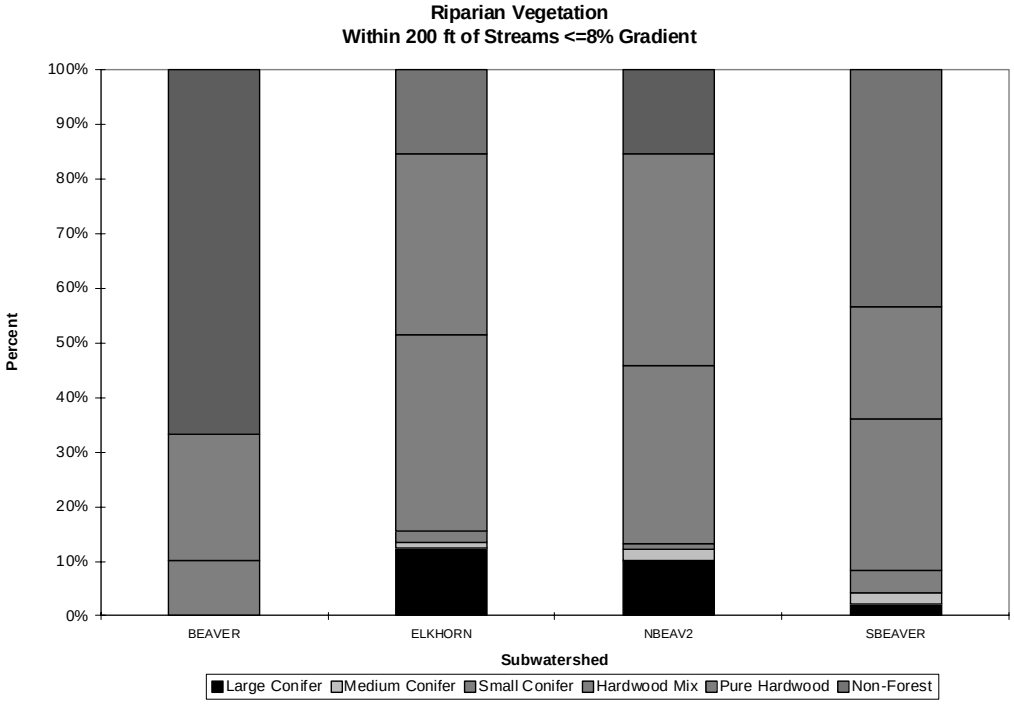


Figure 4: Riparian Vegetation Along Flatter Creeks

State water temperature standards stipulate that a 7-day moving average of the daily maximum temperature shall not exceed 64 degrees F. Exceptions are made for periods of unusually warm weather, or if the naturally occurring conditions prevent the stream from remaining below 64 degrees F.

Fish Populations And Distribution

Anadromous salmonids have access to most of the basin, and many young fish rear in estuarine areas of Beaver Creek (see Map 7: Fish Distribution). Still, fish habitat quality rates as moderate or "at risk" throughout the basin. Steelhead, which prefer faster moving water than coho salmon, range widely, but are not particularly abundant. A few chinook salmon show up occasionally in Beaver Creek, but there is no evidence that the population is self-sustaining (Tony Stein and Bob Buckman, ODFW, personal communication). Beaver Creek is well-known as an excellent sea-run cutthroat stream, although no data on population numbers is available.

On August 3, 1998, the National Marine Fisheries Service listed the Oregon Coast coho salmon as "threatened" under the Endangered Species Act, and has included Beaver Creek in proposed Critical Habitat for this species.[3]

Salmonid spawning and rearing habitats have declined over time due to wetlands development; agriculture; logging and roads; commercial and recreational fishing; ocean conditions; release of hatchery fish; and floods, fire and landslides. In this and other coastal watersheds, wild anadromous runs declined throughout the first half of the century with coho populations plummeting in the 1970s.

Hatchery fish have not been stocked in Beaver Creek. In recent years, a large number of coho salmon from aquaculture operations in nearby Yaquina Bay have strayed into the system, with clear potential to compromise the genetics of wild Beaver Creek coho (Bob Buckman, ODFW). Numbers of wild adults counted by ODFW while spawning in the North Fork, however, suggests the size of the wild run there has persisted in recent years while populations have crashed elsewhere on the Coast. Furthermore, the arrival of the peak wild North Beaver run in December-January suggests there has been minimal direct influence from interbreeding with fin-clipped, adult hatchery coho, which spawn in November (ibid).

Coho runs in the South Fork Beaver Creek have improved in recent years. In the past, some people have speculated that coho runs may not be viable there because of steep conditions on National Forest limit available spawning habitat. Viability of coho seems possible in the South Fork, given recent population information.

Peak adult coho spawner counts on North Fork Beaver Creek between 1950 and 1998 range from about 10 to over 80.

[3] ESA listing uncertain following litigation.

Beaver Creek Watershed Analysis Area
Fish Distribution

Map 7

The Biological Environment: Terrestrial Vegetation

Climate/ Soil/ Vegetation Zones

About 75 percent of the analysis area is within the Coastal Fog Zone (within about 4 miles of the ocean and up major valleys) associated with spruce forest types. The remaining 25 percent is within the Central Interior Zone (towards the east and on higher elevation ridges near the coast) and supports hemlock forest types. Each zone represents a unique combination of landforms, climate and dominant disturbance regimes (see Map 8: Plant Series).

In the Coastal Fog zone, air masses moving directly from the ocean strongly influence the vegetation. During summer the air masses are often saturated, cool, and very stable (fog), which reduces maximum seasonal and daily transpirational demand on the vegetation. Douglas-fir is virtually absent along the immediate coast, and occurs abundantly only on warm, dry sites within this zone. Plant associations appear less distinctive as indicators of the environment. Vegetation is likely influenced by the moderating effect of frequent fog and in part by the influence of wind blowing down trees, overturning the soil, and accumulating large masses of downed logs which affects soil moisture and species composition.

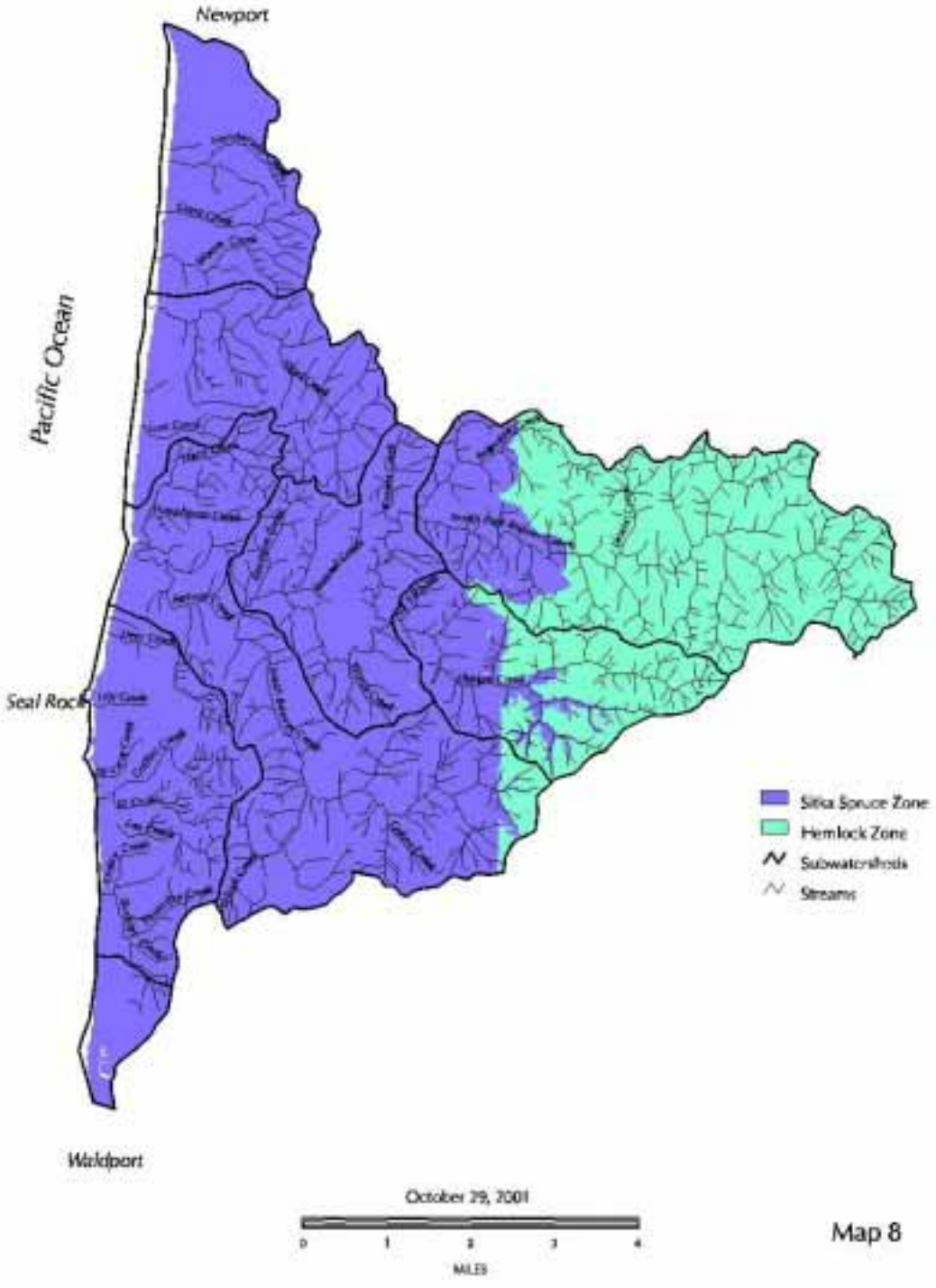
In the Central Interior Zone, fog is mostly absent and Douglas-fir is the dominant conifer. In the Beaver Watershed a higher component of western hemlock is mixed in with the Douglas-fir in the Central Interior Zone as compared with similar watersheds such as the Yachats Watershed.

Overall, spruce dominates stands closest to the ocean; western hemlock is less tolerant of fog and tends to be up on the ridges; Douglas-fir dominates the eastern portion of the watershed; and red alder dominates riparian stringers and scattered small upland patches

The Spruce and Hemlock zones are relatively distinct in terms of site productivity, successional patterns and stand structure. Spruce plant association forests tend to have more open crown covers, with more multi-layered canopies and more conifer in the understory, in the hemlock associations the Douglas-fir stands tend to have more closed canopy covers, fewer layers in the canopy and less understory.

Table 6 emphasizes the relative idealized differences between the two zones; the transition between the two types on the ground is gradual.

Beaver Creek Watershed Analysis Area
Plant Series



Map 8

Table 6. Summary of Climate and Vegetation Influences between the Coastal Fog Zone and the Central Interior.

Plant series (Franklin and Dyrness, 1976)	**Coastal Fog Zone Sitka Spruce Series**	**Central Interior Coast Range Western Hemlock Series**
Climate	Uniformly wet and mild. Fog and low clouds during relatively drier summer months ensure minimal moisture stresses	Wet and mild, under considerable Maritime influences but experiences moisture stress in summer months**.**
Fire regime	Infrequent (500+yr), stand replacement	Infrequent (300-500 yr), stand replacement
Wind disturbance	Chronic wind disturbance. Mortality 2.8 percent per year of live biomass (Green, et al. 1992).	Little wind disturbance. Mortality rate 0.5 percent per year
Productivity	Very high (Franklin and Dyrness, 1973).	High.
Succession	Pioneer species: Sitka spruce. Salt tolerant spruce and salal. Climax tree species: Western hemlock with a mix of spruce and cedar on wet sites. Spruce considered a "subclimax" (Franklin and Dyrness, 1973).	Pioneer species: Douglas-fir. Climax tree species: Western hemlock. Shrubs not as dense as in Sitka spruce series (Franklin and Dyrness, 1973)
Stand Structure	Tree species diversity: More species present Canopy layers: More layering Canopy Closure: higher percent of open canopy; lower tree density	Tree species diversity: fewer species present Canopy layers: Fewer layers Canopy Closure: higher percent of closed to mod. closed canopy; higher tree density

Hardwoods

The amount and distribution of hardwoods has been influenced by human activities. Alder aggressively occupies sites where road building and logging have disturbed or compacted soil. Red alder has been reduced or eliminated through vegetation management in plantations. Many alder sites have been converted to conifers or cut for firewood.

Seral Stage Distribution, Species Composition and Structure

This watershed contains a wide distribution of seral stage vegetation types, as shown on Map 9: Current Vegetation and reported in Table 7[4]. Compared to historic conditions, vegetation patch sizes have decreased, mature conifer has been reduced and early seral, young conifer and conifer-mix have increased. Mature conifer and mix currently occupies about 30 percent of the watershed vegetation (about 45 percent on USFS, 35 percent on BLM, 25 percent on private industrial and 21 percent on other private, state and city).

Mature forests are prevelant on National Forest. These forests are characterized by Douglas-fir, western hemlock and western redcedar with diameters greater than 30 inches and scattered shade tolerant understories. Some of these stands are typed as old growth, but may lack some structural characteristics. Beaver Creek natural stands have a much higher proportion of western hemlock than most areas of the Siuslaw National Forest. Mature habitat on other ownerships consists of mostly conifer/hardwood mixes.

The current condition of the landscape is a result of the intensive timber management and agriculture that has occurred here. These have become the human agents of change, in addition to the natural agents of fire and wind. Clearcutting has been the predominant regeneration system and the shade intolerant Douglas-fir was selected for reforestation.

Private Industrial Forest Land: Intense timber harvesting (clearcutting) has occurred throughout the 20th century with many plantations established following large scale harvesting around 1980. Herbicides still used to control brush competition and road density is high.

National Forest: Logging was done in a pattern of dispersed patches of about 40 to 80 acres, producing "edges" and fragmention of the natural forest. Site preparation, genetically-improved seedlings, and use of herbicides contributed to rapid reforestation. The plantation records show during the 1960's and 1970's a very high frequency of herbicide use, up to 6 - 8 visits (though usually just portions of a unit were sprayed each time). This heavy herbicide use corresponds with the reputation of this area as the most brush prone on the Siuslaw Forest. Herbicide use was curtailed in the mid-1980's . In the 1970's a more shade intolerant species (western hemlock, western redcedar and grand fir) were planted in replants or in brush prone areas. Within 3 miles or so of the ocean, the planting of Sitka spruce and western hemlock was emphasized, particularly from the early 1980's on. Shade-tolerant species were also expected to seed in naturally.

Precommercial thinning of very young stands in the 1960's and 1970's favored the faster growing Douglas-fir as crop trees and was done to mostly 14 or 13 foot spacing (a few at 12 feet). Plantations contain denser, more evenly spaced stands of trees than natural stands. Dense planting was intended to ensure survival of conifers to a given stocking level and to support later intermediate thinning entries.

[4] Based on field corrected satellite imagery.

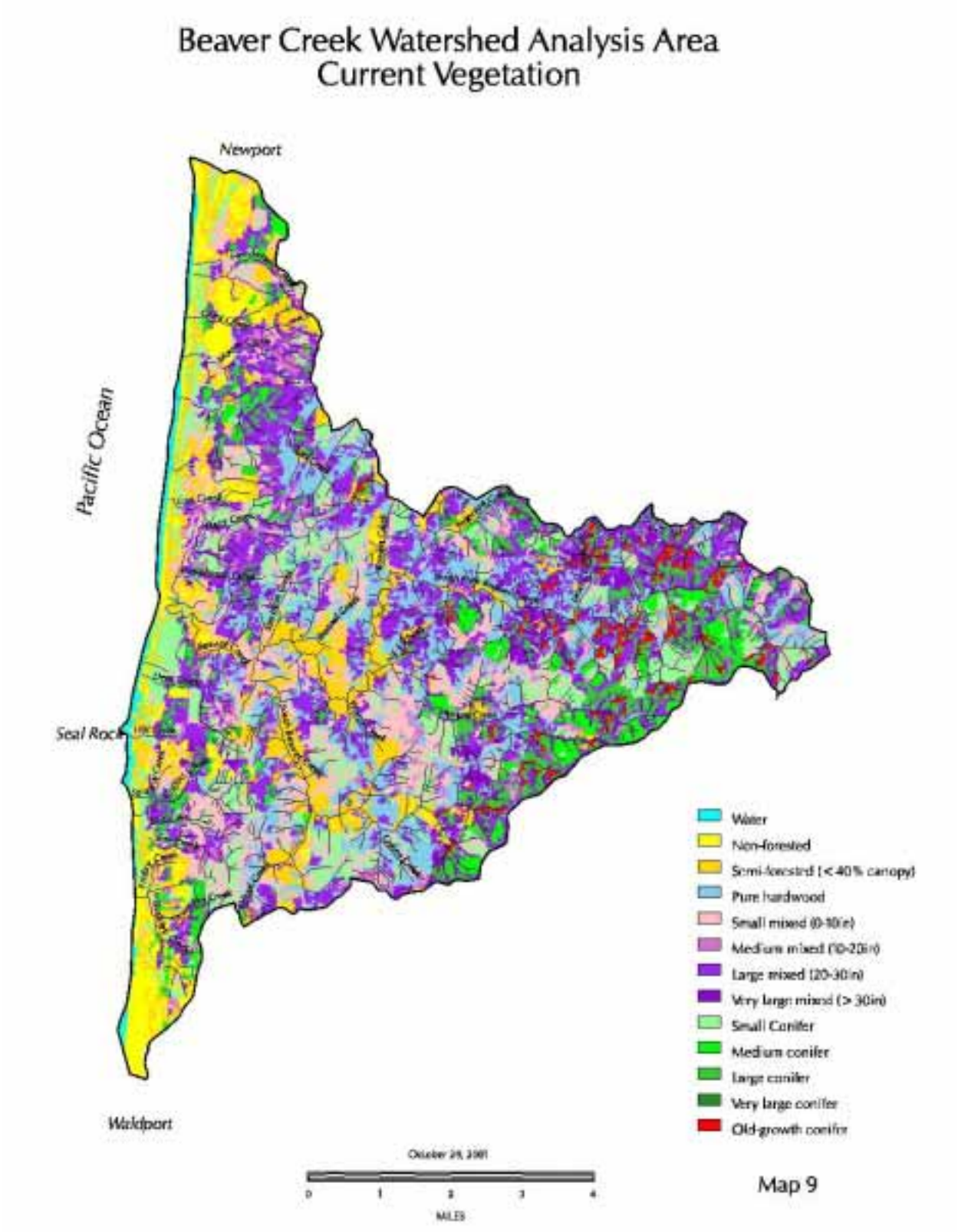

Beaver Creek Watershed Analysis Area
Current Vegetation
Newport
Pacific Ocean
Seal Rock
Waldport
Water
Non-forested
Semi-forestrd (< 40% canopy)
Pure hardwood
Small mixed (0-10in)
Medium mixed (10-20in)
Large mixed (20-30in)
Very large mixed (> 30in)
Small Conifer
Medium conifer
Large conifer
Very large conifer
Old-growth conifer
October 29, 2001
0
1
2
3
4
MILES
Map 9

Table 7. Seral Classes by Land Ownership

Seral Class	USFS	BLM	Private Industrial Forests	Other Private	State & City	Percent Of Watershed
Open	5	0	178	976	120	4%
Semi-closed	235	3	696	2944	53	12%
Broadleaf (all sizes)	1572	79	1534	2102	5	16%
Small conifer & deciduous mix (<10" dbh)	1191	63	1966	1491	62	15%
Medium conifer & deciduous mix (11"20")	1338	1	565	254	36	7%
Large conifer & deciduous mix (21"-30")	1910	65	1880	1994	41	18%
Very Large Mix (>30")	1213	17	123	345	1	5%
Small Conifer (<10")	938	67	1284	679	468	11%
Medium Conifer (11"--20")	938	3	156	365	111	5%
Large Conifer (21"--30")	1533	21	113	255	12	6%
Old-growth[5]	**455**	**11**	**4**	**12**	**0**	**1%**
Water	0	0	1	52	0	.2%
Total By Owner	11,328	330	8,500	11,469	908	32,535 100%

Fire History

The Coast Range tends toexperiences large (10,000 - 100,000 acre), severe fires with long intervals (300 - 500+ years). These fires are expected to be stand-replacing with most of the surviving conifers in riparian areas. The result is that large blocks of single seral stage conifer dominate the landscape over time. A study of fire events over the past few centuries has been undertaken by Teensma. The study resulted in maps which display approximate boundaries of fire events and seral stages that occurred in the Coast Range. This typing shows a historic series of overlapping fires, beginning with the major Yaquina fire in 1850; this watershed then had a large fire in 1890, much of which was reburned in 1920 (Table 8 and Map 10). Map 3 depicts areas where wildfire was evident to GLO surveyors in the late 1800's (landtype FSH Bu).

[5] Old growth estimate may be high – field verification indicated that these stands lack some structural characteristics distinguishing old growth.

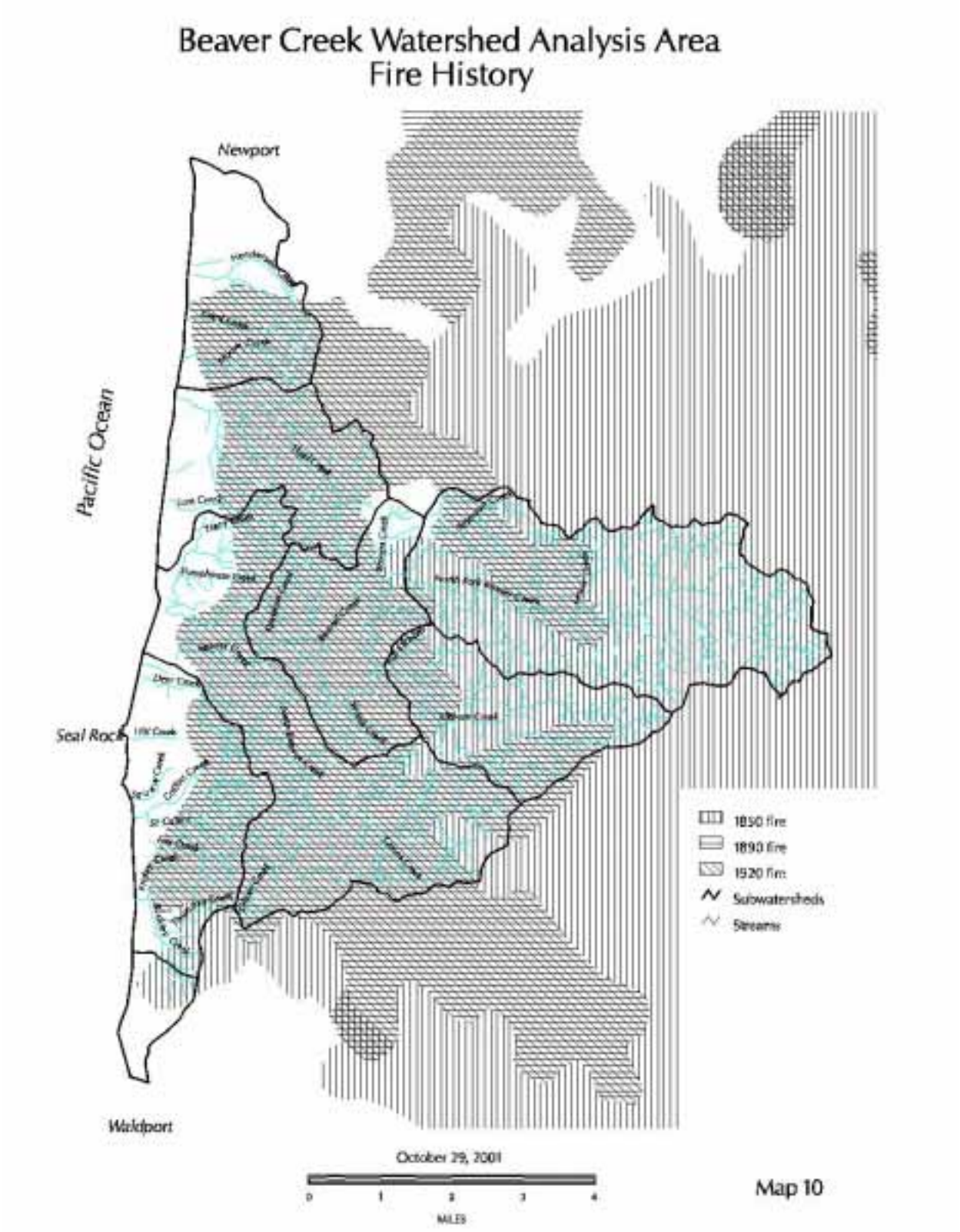

Beaver Creek Watershed Analysis Area
Fire History
Newport
Pacific Ocean
Seal Rock
Waldport
1850 fire
1890 fire
1920 fire
Subwatersheds
Streams
October 29, 2001
0
1
2
3
4
MILES
Map 10

Table 8: Fire History

Year of Fire	Acres
1850	8,773
1890	17,966
1920	17,964

Blowdown

In the winter, frequent and widespread strong winds blow from the southwest in association with storms moving onto the coast from the Pacific Ocean. At the most exposed ridges of the Coast Range it is estimated that gusts up to 150 mph and sustained speeds of 110 mph occur at 5 - 10 year recurrence intervals (Wade, 1987).

Wind is a more dominant disturbance factor in the Coastal Fog Zone than in the Interior. The effect is to cause small (1 to 10 acre) patches of trees to blow down, creating openings in the forest and providing woody material to the forest floor and stream channels. Less frequently, surface winds cause diffuse blowdown over large areas and widespread property damage. The most destructive winds are those which blow from the south, parallel to the mountain ranges. The Columbus Day storm of 1962 was of this type. The resulting openings provide places for shade intolerant species, such as Douglas-fir and hemlock to move in, thus increasing species diversity in a stand of trees and possibly speeding up succession toward multistory and late-successional conditions.

Coarse Woody Material

The amount of coarse woody material remaining on a site after harvest is a small fraction of that found in natural young stands (Spies and Cline 1988). During the 1960's through 1983 over 90 percent of the clearcuts were broadcast burned for site preparation and fuels reduction. Beginning in 1984 the Waldport Ranger District drastically reduced its broadcast burning for site preparation.

Historical Anecdotes about Natural Vegetation

A 1918 report by land classifier Lawrence Pagter describes the National Forest land as having once “supported a fine stand of fir, which had been destroyed by fire, but that fir production was present throughout”, ranging from 2 - 30 inches in diameter, 10 - 60 yrs in age and from 2 - 10 thousand board feet (mbf) per acre. Brush was prevalent throughout and very dense in places. Pagter noted, “This township is one of the best timber producing areas found within this Forest”. Pagter found red alder, maple and shrubs in the bottom of canyons.

Local long time resident, Ike Trevarian, noted that most of the watershed was still uncut in the 1920’s. The North Fork of Beaver was pretty well covered with trees, but was heavily cleared for agriculture. He remembers removing mostly 2-3’ diameter but some 4-5’ diameter old spruce stumps.

Disease And Insects

Swiss Needle Cast

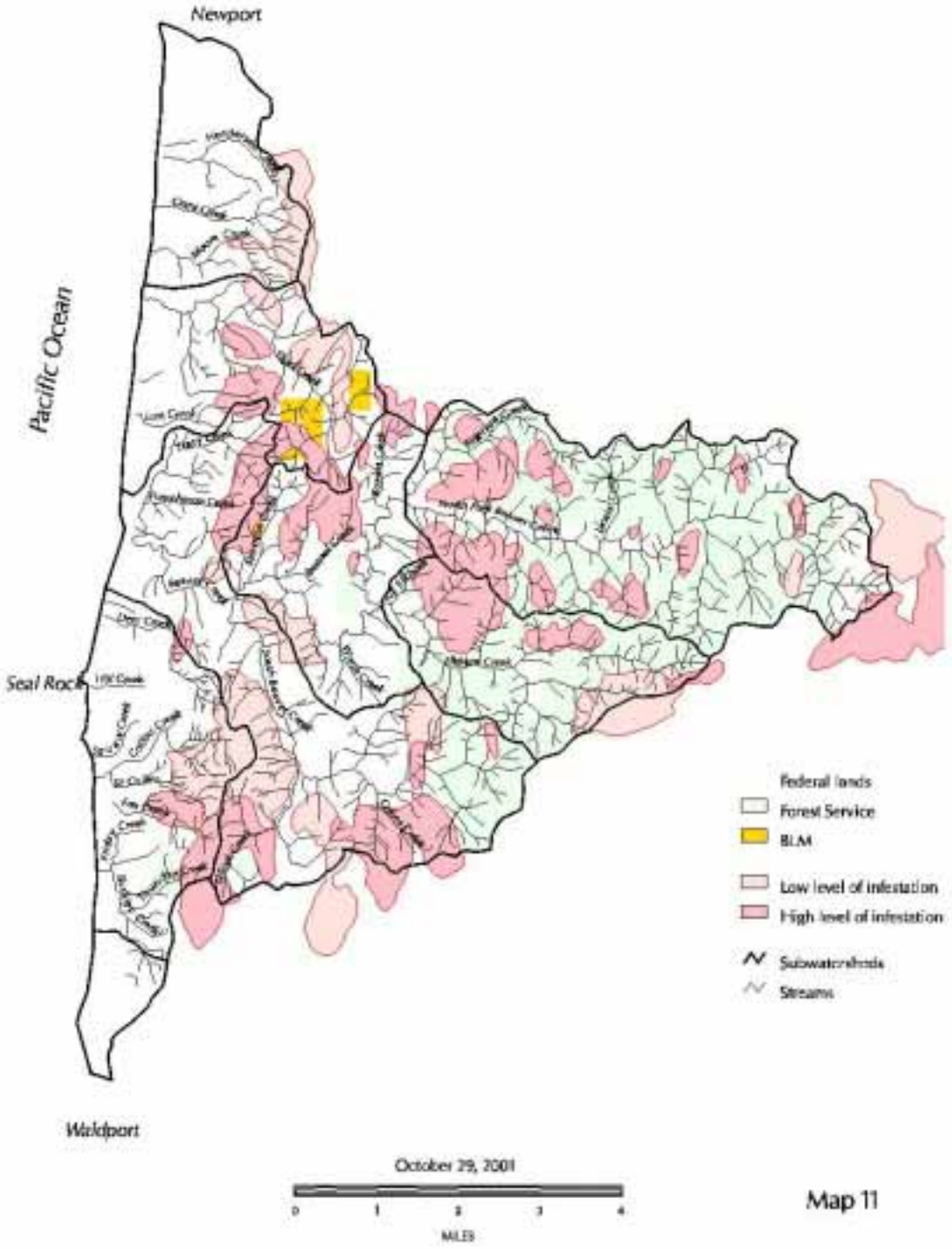
The distribution and severity of Swiss Needle Cast, (Phaeocryptopus gaumanni) has increased dramatically over the last four years along the Oregon coast and more recently, in the Cascades. t causes crown yellowing, a loss of older needles, growth loss and mortality in Douglas-fir. Hansen, 1997 reported that the disease is more prevalent within the Spruce Zone, especially during cycles of above-average precipitation. (Hansen 1997). Despite wet weather cycles in the past, the disease never was as pervasive as today.

Map 11 and Table 9 display data from aerial surveys done in 1998 and 1999. The data indicates that this disease occurs in both the Hemlock and Spruce Zones, with smaller infection sites within the hemlock zone (36 acres vs. 104 for spruce). Field observations indicate that the map probably underestimates the infection level within stands that have less Douglas-fir. Little is known about management effects on this disease, nor why it is increasing so dramatically at this time. One theory is that planting high proportions of Douglas-fir in the Spruce Zone has exacerbated the problem. Other theories suggest that thinning may actually increase the level of infection.

Table 9: Swiss Needles Cast Survey Data

	Acres of Swiss Needle Cast by Severity Level 1998 and 1999					
	USFS	BLM	State	Industrial	Other Private	Total
1998 Low Level	881	32	0	649	560	2122
1998 High Level	2471	50	224	2496	782	6023
1998 Total Infected Acreage	3352	82	224	3145	1342	8145
1998 Landbase Percentage Infected	30%	25%	3%	37%	12%	25%
1999 Low Level	1954	99	0	2136	642	4831
1999 High Level	483	1	39	1465	826	2814
1999 Total Infected Acreage	2437	100	39	3601	1468	1745
1999 Landbase Percentage Infected	22%	33%	4%	42%	13%	24%
Change Between 1998 and 1999	-8%	+8%	+1%	+5%	+1%	-1%

Beaver Creek Watershed Analysis Area
Swiss Needle Cast Infestation, 1999



Map 11

Douglas-fir Beetle

Douglas-fir beetle (Dendroctonus pseudotsuga) is endemic to the Coast Range and can be expected to operate in areas where trees are weakened or killed such as around windthrow pockets and in patches infected by root disease (Hostetler 1996). This beetle is a concern when planning for course woody material creation.

Other Diseases

Sitka spruce tip weevil, Pissodes strobi (also known as white pine weevil) generally affects spruce trees under 50 feet tall and 8 to 30 years old. The tip weevil lays its eggs around the circumference of the terminal shoot, the growing larvae effectively girdle that shoot. Results include top die back, multiple tops, crooks,and stunted height growth.

Light infection levels of hemlock dwarf mistletoe (Arceuthobium tsugense) were noted. Symptoms include swelling on the limbs, witches' brooms, burl like swellings and multi-forked tops. This parasite spreads most rapidly in multi-storied and more open stands. (Sterling, Richard T. 1962.) Hemlock dwarf mistletoe is an endemic pathogen that does produce some favorable habitat characteristics for wildlife, in particular branching platforms that can serve as nest sites for the marbled murrelet.

Root diseases are also light in this area. They include Fomes annosus in western hemlock and Phellis weirii (laminated root rot) in Douglas-fir. Western hemlock is sensitive to decay through wounds due to its thin bark and shallow roots. Laminated root rot kills trees creating snags, down wood and hardwood pockets.

Historical Insect and Disease

In historic times insects and disease were endemic with cycles of increasing frequencies and reductions. They were a disturbance agent that helped provide diversity through time and over the landscape. They contributed to creating openings, snags, down wood and different seral stages.

Botanical Resources - Vascular Plants

Plant habitats and botanical resources have been greatly altered over the past 5 decades when compared to historic conditions. Saltmarsh and tidewater habitats have all been adversely impacted by human activities. Native saltmarsh species and inhabitants of tidal areas occur on fewer acres today when compared to historic levels. These changes are due in large part to diking, channelizing and recreational development along main Beaver Creek.

Surveys for all Regional Forester's sensitive plant species were performed prior to past ground disturbing activities (primarily timber harvest). A conservation and monitoring strategy for loose-flowered bluegrass (Poa laxiflora) was developed by the forest botanist in April, 1993. The Beaver Creek watershed contains no documented locations of loose-flowered bluegrass, however it does contain suitable habitat. This habitat is not considered vital to the persistence of this species. No other sensitive plant species have been located during botanical survey efforts in the watershed.

Noxious Weeds and Undesirable Non-Native Plant Species

Noxious weeds pose an ever-increasing threat to native ecosystems, croplands and other plant communities. Some noxious weeds were purposely introduced to stabilize streambanks (reed canarygrass) or invaded and expanded due to forest road building, clearing of land, or other surface disturbances that made soil/surface conditions suitable for invasion (Scot's broom, blackberry, yellow tansy, thistle, dock, etc.). Many of these species, once established, have the capacity for long term site occupancy (20+ years) and the potential to disrupt natural successional development. Some species that are aggressive colonizers of disturbed sites require frequent disturbance (such as grazing or roadside brushing) for long term site occupancy.

Open roads that allow year-long travel throughout the watershed are the major factor in noxious weed dispersal. The Forest Service currently coordinates the management of noxious weeds through a Memorandum of Understanding with the Oregon Department of Agriculture. Noxious weed lists are maintained by the state agency.

Botanical Resources - Nonvascular Plants

Forty-five species of epiphytic macro-lichens were inventoried in1995, 1996 and 1997 on a landscape grid of 3.4 mile spacing over a large area of the Siuslaw National Forest. The biodiversity of lichens is highly positively correlated with the percent gaps, wolf trees, and old-growth remnants in the stands. Lists of nonvascular plants that may be in the analysis area are available at the Siuslaw National Forest Headquarters.

The Biological Environment: Terrestrial Wildlife and Habitats

Older Forest Habitat

Table 7 previously displayed seral classes by land ownership. The most important seral stages for terrestrial species of concern include mature and old growth conifer dominated communities (large and very large conifer and conifer/hardwood mix stands).

National Forest lands in the Beaver Creek watershed are entirely allocated to Late-Successional Reserve (LSR), within the northwest portion of R0268, the largest LSR on the Suislaw National Forest. LSR management guidelines are intended to maintain and restore older forest habitat.

Mature forests currently occupy about 45 percent of federal lands in the watershed. About 23 percent of the private lands are currently mature. The amount of mature/old-growth conifer habitat in the Beaver Creek drainage today (31 percent) is likely less than the average amount that existed in the watershed over the past 100 -10,000 years. Logging, along with residential and agricultural development within the last 100 years removed many stands of older forest, especially within the lower reaches of the watershed.

When mature forest is disturbed or removed, the microclimate within adjacent stands is affected by increased wind, temperature and radiation, and less humidity (edge effect). Edge effects diminish within two tree heights away from an open area.

The amount and pattern of interior mature forest habitats is important for many species that require relatively moist, cool, dimly lighted environments which are also secure from wind and predators. Species such as northern spotted owl and marbled murrelet have evolved on landscapes composed of large patches of older and interior forest and are adversely affected by forest fragmentation.

In addition, many species with small home range sizes or limited dispersal ability (i.e. amphibians, small mammals, fungal and lichen species) are dependent on large patches of forest and associated habitat attributes for "genetic communication."

Table 10 displays the acres of mature and older interior forest within the analysis area. About three percent of federal lands within the watershed are currently functioning as interior forest habitat. No effective interior forest habitat remains on private land. About one percent of this watershed as a whole can currently support interior forest species near optimal levels. Historic conditions likely provided much greater security and dispersal success from continuous mature forest for long periods of time. Map 12 shows the distribution of mature and interior forest in the watershed.

Table 10: Mature And Interior Forest By Ownership

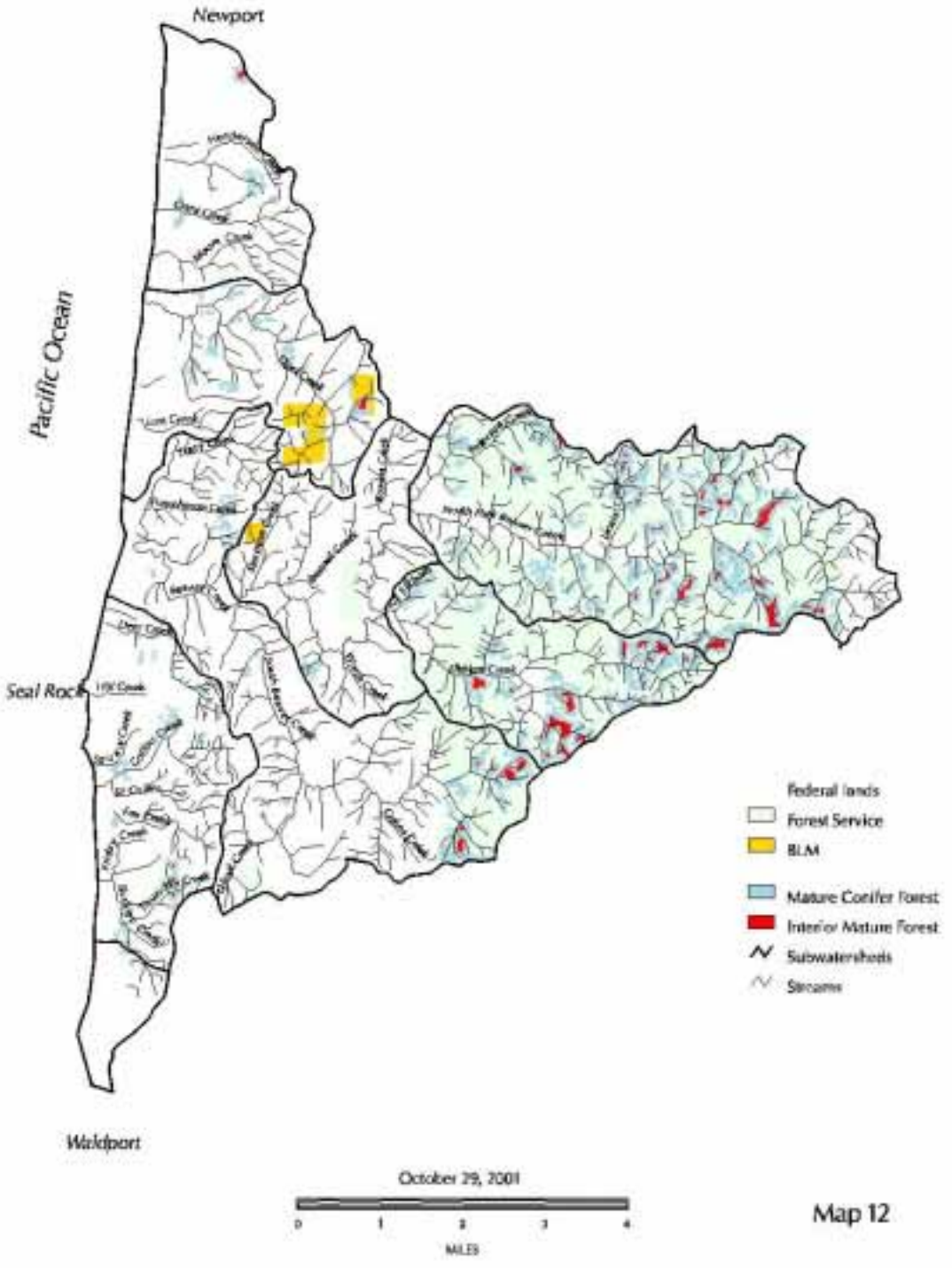
	Ownership					
	USFS	**BLM**	**Total Federal**	**City & State**	**Private**	**Total**
Acres of Mature Forest Habitat	5,111	114	5,225	54	4,726	10,005
Percent of the Land Base	45%	35%	44%	6%	24%	31%
Acres of Interior Forest Habitat	394	20	414	--	--	414

Connectivity through and to other areas of mature/old growth habitat on the landscape is an important role this watershed plays on a large scale. To the south and east, dispersal habitat for mature/old growth dependent species is good due to the pressence of Drift Creek wilderness and public lands. To the north, dispersal habitat for mature/old growth dependent species is very poor due to large areas of private land intensively managed for timber production

The July 1995 Assessment Report of Federal Lands in and Adjacent to Oregon Coast Province (pg 59-60) identified the Key Watershed portion of Beaver Creek (along with the Drift (Alsea), and Toledo watersheds) as one of five areas of the Siuslaw National Forest with relatively high proportions of mature conifer and interior forest habitat (and correspondingly low road density).

Federal lands are likely to recover to near historic levels given enough time under the LSR allocation in the Northwest Forest Plan. Private lands will not likely provide interior forest habitat in the future.

Beaver Creek Watershed Analysis Area
Interior Forest



Map 12

Designated Critical Habitats

Critical habitat (CH) within the Beaver Creek Watershed is designated only on federal lands by the U.S. Fish and Wildlife Service. The purpose of critical habitat designation is to help focus conservation activities for a listed species by identifying areas that contain the physical and biological features that are essential for the conservation of that species.

Beaver Creek watershed contains CH for spotted owls and marbled murrelets. Approximately 9,400 acres are designated spotted owl (Strix occidentalis) CH, of which about 3,700 acres (30 percent) currently provide suitable habitat. Approximately 15,700 acres are designated marbled murrelet (Brachyramphus marmoratus) CH, of which about 4,300 acres (27 percent) is currently suitable.

Special Habitats

Special wildlife habitats in the watershed include ponds, marshes, sloughs, and tidewater areas where salt and fresh water mix. Beaver Creek watershed does not contain any cliffs, talus slopes, rock faces, caves or lakes.

The 77-acre Zeke's marsh (Estella Matilda Happ Wetland depicted on Map 5) in the lower portions of main Beaver Creek contains all the special habitats found in the Beaver Creek watershed in addition to groves of flooded spruce forest that are now mostly snags.

Estuarine habitats, as those found in the lower most reaches of Beaver Creek and in Zeke's marsh, are particularly unique and provide a wide variety of feeding and reproductive habitats. Alteration of these habitats has reduced their suitability for waterfowl, for instance, heron (Ardea herodias) rookeries that once existed in the Beaver Creek drainage have been logged out. Although fewer birds use the Beaver Creek watershed in the summertime (as compared to historic conditions), high flows spill over the dikes and ditches and attract over-wintering waterfowl, especially during severe storm events.

Late-Successional Forest Species and Populations

Survey information is available for several species that use primarily mature conifer forest including spotted owl, marbled murrelet, and bald eagle (Haliaeetus leucocephalus). The data were collected in cooperation with the Oregon Department of Fish and Wildlife, U.S. Fish and Wildlife Service.

Spotted Owl

No spotted owl nests or territorial single sites are known within the watershed. The Beaver Creek watershed provides some high quality spotted owl habitat, and relatively large amounts of mature conifer forests stand in the Drift Creek Wilderness area. Thus, the mature conifer habitats in Beaver Creek might soon become occupied by dispersing juvenile spotted owls.

Marbled Murrelet

One marbled murrelet reserve[6] is established on federal lands in North Beaver Creek. Only a small portion of the watershed has been surveyed for marbled murrelets. Although murrelet activity has been documented in only one area of the watershed, moderate size (50-90 acres) blocks of interior habitat conducive to murrelet use occur on the Federal lands portion.

Bald Eagle

Twenty-three Bald Eagle Management Areas are designated on the Siuslaw National Forest (11 occupied sites and 12 potential). One of these is located on private land in the central part of the Beaver Creek sub-watershed. Another eagle nest site is located on the ridge immediately south of the Estella Matilda Happ Wetland. The mouth of Beaver Creek to the South Fork Beaver Creek Bridge provides excellent feeding habitat. Suitable eagle habitat also exists on federal lands in the upper North Beaver and Elkhorn sub-watersheds.

Big Game

Elk (Cervus elaphus) and deer (Odocoileus hemionus) thrive in areas that provide a diverse range of habitats. Both openings and cover areas serve to meet the nutritional and security needs of deer and elk. Oregon Department of Fish and Wildlife (ODFW) monitors big game trends in number and specific demographic parameters through harvest levels and post hunting season counts. The Beaver Creek watershed is within the Alsea Big Game Hunting Unit (2,000 square miles), of which the Beaver Creek watershed (50 square miles) is only a part. The entire Alsea Unit population management objective for elk is 7,000 animals with a Bull:Cow Ratio of 10:100. ODFW officials believe approximately 5,600 animals currently inhabit the Alsea Unit and that the Bull:Cow Ratio is approximately 5-7:100. ODFW officials also report that Roosevelt branched antlered elk occur in higher than average numbers in the Beaver Creek watershed portion of the Alsea Unit, indicating good security due to cover areas and relatively low open road density. The current condition of the watershed is good for elk and deer due to a diverse mix of successional stages and cover conditions.

Other Selected Wildlife Species Of Interest

Amphibians and Reptiles

Formal surveys for reptiles and amphibians have not been done in this analysis area. However, species that would be expected to occur in the watershed based on habitat conditions include (but are not limited to) roughskin newt (Taricha granulosa), Western redbacked salamander (Plethodon vehiculum), Northern alligator lizard (Gerrhonotus coeruleus), Dunn's salamander (Plethodon dunni), Western terrestrial garter snake (Thamnophis elegans), and red-legged frog (Rana aurora). Surveys within the Beaver Watershed are recommended during the months of April to June.

[6] A reserve is an area of contiguous murrelet suitable habitat within 0.5 miles of an occupied site.

Northwestern Pond Turtle

The Northwestern pond turtle (Clemmys marmorata marmorata) is a listed sensitive species inhabiting marshes, sloughs, ponds and slow-moving sections of rivers and streams. Formal surveys for this species have not been done in the watershed. The best habitat in the watershed occurs in the vicinity of the 77-acre Zeke's marsh (Estella Matilda Happ Wetland). Pond turtles likely inhabit other areas within the watershed where slow moving water exists adjacent to forested riparian vegetation.

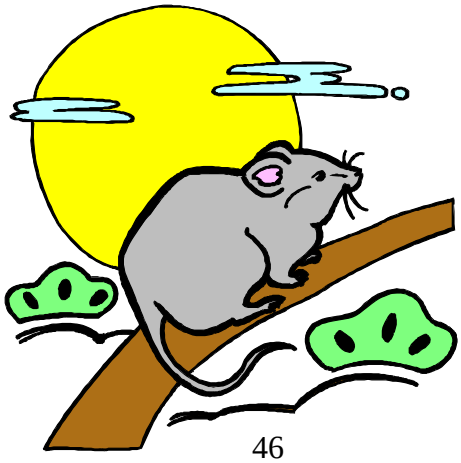
Bats

Ten bat species are known to inhabit the Oregon Coast Range. Beaver Creek watershed likely contains habitat suitable for all of these species. In 1996, a study by Oregon State University of use of bridges by night roosting bats was initiated on the Siuslaw National Forest, as well as adjacent BLM lands. Although none of the bridges in the Beaver Creek watershed were surveyed, seven of the ten species of bats in the survey area were found to be using bridges for night roosts that are similar to bridges in the Beaver Creek watershed. Yuma myotis (Myotis yumanensis); little brown myotis (M. lucifugus); long-legged myotis; and big brown bat, (Eptesicus fuscus) were the most commonly caught species.

Three additional species were documented in the survey: long-eared bat (Myotis evotis), fringed myotis (Myotis thysanodes), and Townsend' big-eared bat (Corynorhinus townsendii). Fringed myotis is documented as occurring in the watershed on the southern boundary of the Elkhorn sub-watershed. Abandoned buildings and barns, snags, loose tree bark and canopies of mature forest also provide habitat necessary for roosting, hibernation and raising of young. Mature conifer forest may provide the best habitat for bats within the watershed. Surveys of bridges and other suitable bat habitat are recommended in the Beaver Creek watershed.

Red Tree Vole

Red tree vole (Arborimus longicaudus) is listed as a Survey and Manage Category C species in the Northwest Forest Plan. The red tree vole (RTV) is closely associated with old-growth Douglas-fir forests however it has also been found in young-mature Douglas-fir forests as well. RTV tend to select large, live trees with large branches for nest sites and shelter and feed almost exclusively on Douglas-fir needles. Suitable habitat for RTV exists in the watershed with approximately 66 percent of the land in Federal ownership meeting the habitat minimum of Douglas-fir dominated forests of 11" diameter at breast height and 60 percent crown closure.



The Social Environment

Native American Influence

The Yaquina /Alsea Indian people inhabited the Beaver Creek area. They shared language and many cultural practices in common and are usually treated as one cultural unit. Never a numerous people (Drucker 1939), they were content to exploit the rich resources of the ocean and estuaries, making some trips inland to hunt or to gather camas and berries. They collected fish and shellfish in large quantities; salmon was of foremost importance due to its abundance and being able to dry it for winter storage. Infrequently, sea mammals were hunted.

An Executive Order created the Siletz Reservation on November 9, 1855, which closed the coastal area of Oregon from Lookout Point to the Tahkenitch Lake outlet to non-Indian settlement. The intent of the government was to reserve that vast region as a permanent homeland for the warring tribes of southwestern Oregon as well as the peaceful coastal bands. On December 21, 1855 an Executive Order opened the region from two miles south of Siletz Agency to the mouth of the Alsea (which included the Yaquina and Alsea estuaries) to form a corridor through the center of the reservation so that a railroad could be built to Yaquina Bay. A great rush of settlers poured in. The Indians were literally driven out as the settlers moved into this area and made their claims. The Indian culture had by that time already been altered. Populations had been reduced by exposure to diseases they had no resistance to and reservation life had eroded their traditions.

Euro-American Influence

Euro-American settlement increased steadily in the 1880's and 1890's. Homesteaders moved far up into the local valleys and cleared forests, grazed dairy cattle and raised hay and garden crops. Farming and ranching occur today.

Commercial logging operations began after settlement in the 1870's and 1880's. Small family-based mills were established for mostly local consumption.

Forest Service Management History

Lands now identified as the Siuslaw National Forest were created on March 2, 1907, when President Theodore Roosevelt signed an Executive Order adding 16 million acres to the forest reserves. In 1916, some lands in the watershed came under federal management through the Chamberlain-Ferris Act, coming under jurisdiction of the Bureau of Land Management in 1946 (Indian/Deadwood WA, 1996).

After World War II , the demand for lumber increased and political pressure was exerted on National Forests in the to provide wood. The harvest of national forest acres increased rapidly after the 1950's.

The vast majority of the harvest activity after 1960 was clearcutting, with regeneration of Douglas-fir, the fastest growing timber-producing tree in this area. In the 1970's, the use of skyline cable yarding allowed harvest of trees from very steep slopes. By 1995, nearly 5.000 acres of National Forest land in the Beaver Creek watershed had been logged.

Roads

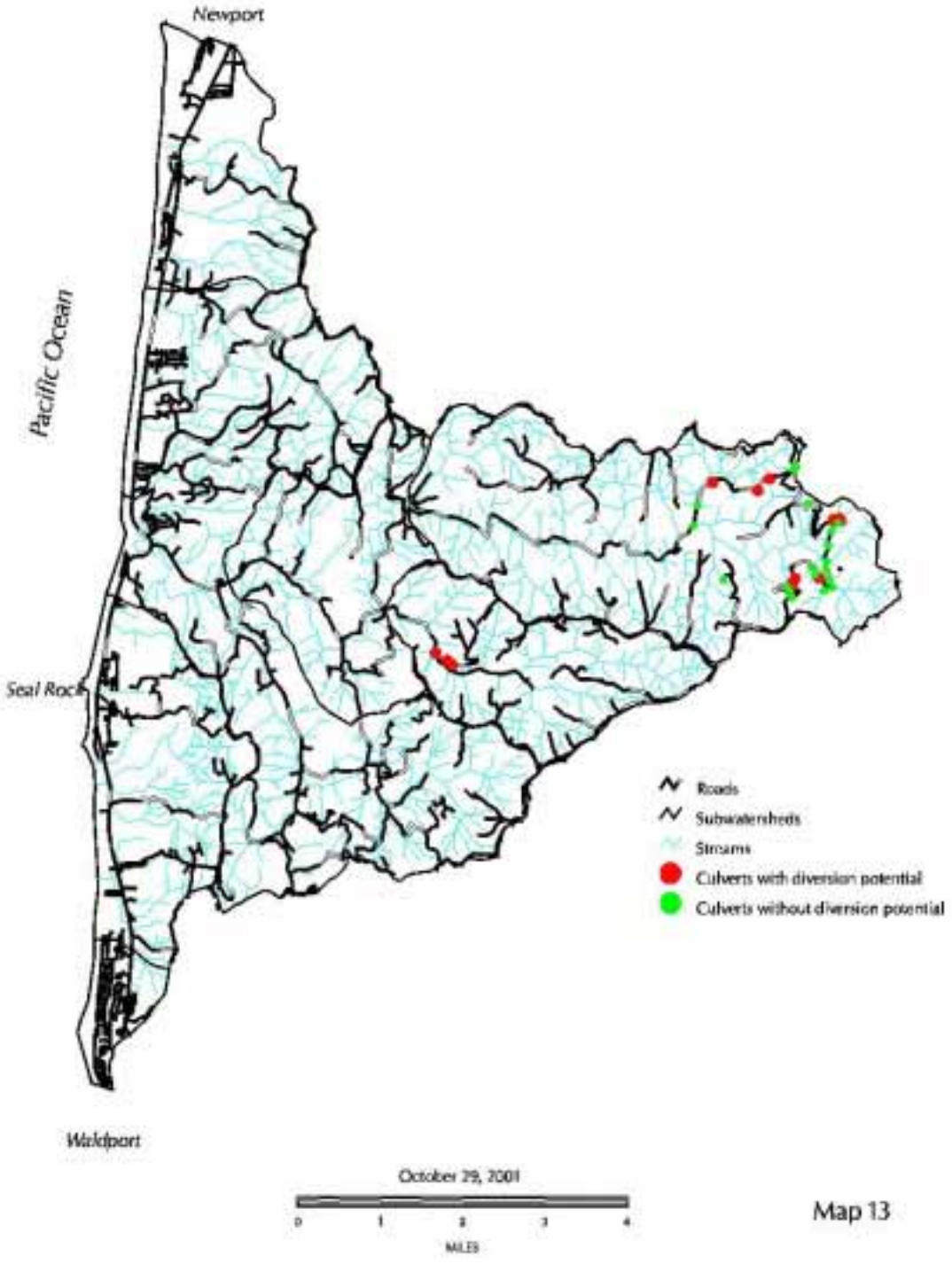
The Forest Service road system within the Beaver Creek watershed is one of the newest road systems on the Siuslaw National Forest. Most roads are located on ridge tops, and are considered stable. Road decommissioning has occurred on a portion of Forest Road 5000.

Culvert data from a survey done in 1995 was analyzed to see if any culverts need replacement or modification. The information is listed in Table 11 and Map 13. A culvert/fish passage survey in summer 2000 did not reveal any new problem areas.

Table 11: Culvert conditions in the Beaver Creek Watershed from the 1995 road survey.

Culvert (NSID) Number	Road Number	Stream Affected	Problem	Culvert Diameter	Diversion Potential
44	5031	N.Fk Beaver	ok	9 ft	none
45	5031	N.Fk Beaver	Rusty pipe, erosion at outlet	18 inches	none
46	5031	N.Fk Beaver	Slide at outlet, outlet partially plugged	24 inches	yes--200 feet
47	5031	N.Fk Beaver	Slide at outlet, outlet partially plugged	18 inches	yes--200 feet
48	5031	N.Fk Beaver	ok	18 inches	yes--70 feet
51	spur 49 off Rd 5000	N.Fk Beaver	Inlet almost completely plugged	15 inches	none
52	spur 49 off Rd 5000	N.Fk Beaver	Inlet partially plugged. Outlet eroding and undercutting road	18 inches	none
87	5000-240	N.Fk Beaver	Rusty pipe	36 inches	none
88	5100	Elkhorn	Badly rusted pipe	18 inches	yes-30 feet
89	5100	Elkhorn	Partially plugged inlet	24 inches	yes--400 feet
90	5100	Elkhorn	Erosion at outlet	18 inches	yes--800 feet

Beaver Creek Watershed Analysis Area
Roads and Culverts



Map 13